Perhaps the solution will be found in the gradual development of a new type of teacher: the university clinician, capable both of intelligently bridging the academic and clinical years and of establishing a more profitable co-operation between the various departments of the university.

The fundamental question is, how may the necessarily limited time of medical education be most profitably employed in imparting to the student such knowledge as is most useful to him in his future career? How has the faculty answered this question? In the majority of instances, by confronting the student with additional subjects, additional courses, additional units, additional text-book details, additional parrot-like recitations, and with it all the four-year system is still religiously adhered to. It is just this cramming process and especially the unfortunate appropriation of time by the teachers in the intermediate subjects that causes tired and neurasthenic students; the able men are severely maimed, the weaklings are ruined for life as they become veneered with prejudice, having never learned to think for themselves or to work unaided. Starling aptly remarks that in giving his whole soul to his work the student loses his soul. How can we expect a tired student to exercise a trained reflective and analytic habit of mind on the numerous problems which present themselves?

Some medical schools of the ambitious university type have, I am convinced, reached the height of pedagogic absurdity in their endeavor to elevate the standard of medical education.

To discover and to teach are distinct functions; they are also distinct gifts and are not commonly united in the same person. While teaching involves external engagements, the natural home for experiment and speculation is retirement. Failure to appreciate the difference between the dissemination of knowledge and the advance of knowledge, has given rise to much confusion of thought and a tremendous loss of time and energy.

Is it not prostituting science to expect an eminent research man to teach freshmen? Is it not wholly unjust to both? Again, why should medical men be taught by physicists who know nothing of the physics required in physiology and practical medicine, and by chemists whose interest does not lie in the problems of pathological and physiological chemistry? Were it not better that chemistry be taught by the physiological physicist, by medical men who have gone through the whole training and know the needs and aim of practical medicine? At the beginning of their career, medical students become the sport of biologists, who use them as the flotsam and jetsam of their seas of learning and oceans of theories. "Biology as taught by non-medical men must go."* Teachers of anatomy must not forget that surgery is the proof of anatomy. Minute descriptive anatomy should not be allowed to crowd out applied anatomy, to the ultimate embarrassment of the junior student who enters the operating-room or faces the course in operative surgery.

* The writer was more profoundly impressed by the discussion on the scientific education of the medical student at the 76th annual meeting of the British Medical Association than by all other similar addresses. (Br. Med. J., Aug. 15, 1908.)

We should weigh carefully the suggestion made by the world-renowned biologist, Jacques Loeb—that the prevailing mode of teaching anatomy, i. e., from the morphological viewpoint, has an atrophying effect upon the student's scientific interest and should give way to the functional method of teaching.

The ordinary student who is destined to become a general practitioner ought not to be required to spend time on the acquisition of knowledge which he will never use. The whole of his studies should have a distinct bearing on, and lead up to, the knowledge of the human body and its control in disease. The whole medical college should not be compelled to spend a disproportionate amount of time and energy upon subjects which will be of real use to a very few only, whilst subjects of the greatest importance have to be neglected in proportion to the amount of time devoted to ultra scientific matters. The accessory sciences must of necessity be subordinated to the highest purpose in the education of the medical man—to make him fit for the exercise of his future duties.

Were some medical faculties to pause and remember the immortal words uttered two thousand years ago by the Father of Medicine, "Art is long, time is short and technique is difficult," they would abandon the role of precedent worshipers, extend the medical rather than the premedical curriculum, cease developing the student's memorial powers, stop training parrots, get rid of "antiquated dictionary stuff," abolish the monastic system of examinations, and thus eliminate the large element of lottery, lead the student to the bedside at a much earlier date, devote three-quarters of the curriculum to clinical work, make the teacher responsible for the student, restore the old time close relation between the teacher and the student, and thus contribute to the primary aim of education, the formation of character and intellect.

"True and complete success in life requires more than mere aptness for learning, or the possession of a retentive memory, or facility of written or oral expression, or mere energy and zeal."

A man may possess all of these qualities and still lack the one indispensable requisite to ensure success in practical affairs—character—character and all that this term connotes, thoughtfulness, sympathy, courtesy and culture."

The teacher of the future must establish a forward outlook and instill hope in the student's mind. Hope, the dominant feature of modern thought, hope for the morrow, hope for the future, anticipation of something better, some improvement, or, at the very least, some change. Hope is the keynote of progress and the certain safeguard against retrogression.

SOME POINTS TO BE CONSIDERED IN FEEDING INFANTS.*

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A simple enumeration of those digestive juices and ferments which are known to be essential must comprise at least fifteen substances, most of which

* Read in the Oakland Medical College Lecture Course, March 22, 1911.

are imperfectly studied. Realizing this, how difficult must it be to get any clear view of the physiology of digestion and its bearing on the problems we have to solve in feeding infants. Recent work has added much to our knowledge of the digestive process. However, what has been added is but a trifle compared to what still remains to be elucidated.

Before beginning the substitute feeding of children, one should study the physical and chemical differences between cow's milk and human milk and the differences in the structure of their fats and salts, and further, to search out the modifications of human digestion as affected by bovine milk fat and bovine albumins and salts. Not only must these factors be considered in any review of the digestion of substitute foods, but the modifying influences of the bacterial flora ingested with cow's milk must be taken into consideration. A further subject which must now occupy a foremost place in our considerations, is the effect of errors of metabolism on digestion. Too long have we been concerned only with digestive process to the neglect of the study of food absorption and utilization.

Beginning with the demonstrated existence of physiological stimuli and of appetite stimuli shown by the Pawlow School to be efficient both for gastric and pancreatic secretion, we find that these unquestioned facts find little application in current pediatric practice, and yet the practical value of the first is demonstrated in the marked improvement in the condition of an ailing child that often follows a change of nurses or of environment without any change in food mixtures. The installation of an understanding kindly nurse will often, without diet alteration, initiate a marked upward movement in the weight line of an infant who has been doing badly on a reasonable food mixture. The weight response to quiet, comfort, or warmth also testifies as does the improved health of the child to the validity of the principle.

That digestion waits on appetite is nowhere better demonstrated than in infant feeding practice. Anorexia and many nutritional upsets, especially those that follow overfeeding, are readily relieved by increasing the intervals between meals and reducing the number of meals to five in twenty-four hours if the child be less than a year, or if he is between his twelfth and sixteenth month, to four; and from this time on to three feedings in 24 hours.

The amount of food to be given at a meal presents a problem variously answered. Some would base the size of an infant's meal on the average amount taken by a healthy baby from the breast, determined by ante and post prandial weighings. This is no standard at all as the child rarely takes a like amount at two feedings. Again, the size of the stomach determined post-mortem has been suggested as a guide but so variable is the size at any given age, and so fallacious the possible measurements, that this idea has passed, especially since the showing of Tobler that the fluid parts of milk begin at once to leave the stomach and that the volume of the curd is much less at any moment than the volume of the milk ingested. Appert has laid down the rule that a reasonable meal is one approximating 1/50 of the body weight and that a daily ration of 1/10 of the body weight plus 8 ounces is appropriate. Even this is open to the objection that weight varies with condition and the wasted child of six months old may weigh less than the well nourished one of three and yet need twice as much food. However, it may be accepted as a fair working rule, if we keep in mind that children need at least one gram of albumin per pound per day, or about what is contained in one ounce of milk.

A few years ago almost all American pediatrists, and among the Germans such men as Schlossman, Gaertner, and Monti, based substitute feeding on an attempt to modify cows' milk by manipulation until it became an artificial mothers' milk. Even had the chemical and physical make-up of the milks been identical, which they are far from being, the lack of uniformity in the proportions of fat, sugar, and albumin, contained in milk, doomed this plan to failure. Van Slyke has shown that in single milkings of individual cows, fat percentages vary from 2.25 to 9% and protein percentages from 2.19% to 8.5%, casein percentages from 1.5 to 4.5. In herd milk, fat variations from 3 to 5.50% occur, and the proteid content fluctuates between 2.3 and 3.7%. Even in milk resulting from blending the milkings of many herds percentages varied from 3 to 4.6% fat, 2.5 to 3.75% proteid, 2 to 3% casein. According to this author the variations were dependent on the following factors: (1) the individuality of the cow, (2) the breed, (3) the stage of lactation, (4) the ingested food, (5) the season, (6) the time and manner of milking. Half liters taken successively in a single milking of one cow gave in fat, percentages 2.2; 2.9; 3.5; 3.7; 3.8; 3.9; 4.6. As the milk of woman has been shown to be equally liable to variation it is obvious that all mathematical systems must fail in practice. Even to determine what the individual child ingests would be impossible unless one were able to resort to the Pawlow method of feeding with an oesophogeal fistula. The milk secreted for the breast pump is not the same as that secreted under the stimulus of nursing. The last parts of the nursing are richer in fat than the first and even could we empty the stomach by tube after feeding, the changes wrought by digestion would vitiate the results of analysis. As to the chemical differences in the fats, proteid, and minerals, of the two fluids they are so great that in such a paper they can be no more than indicated. In the fats of bovine milk the melting points are higher than in human, with a result that they are less completely fluid in the infant's stomach and tend to coat proteid curds and so interfere with peptic digestion. The fatty acids carry in their construction many more of the unsaturated carbon groups than do fats of human milk. These are more readily set free in the stomach and often become a source of irritation. It is probable that in some instances that they prevent the proper opening of the pylorus. Such fatty compounds, lower in olein content than those of human milk, seem to form insoluble soaps more readily. This action is accelerated by the excessive amounts of salts, especially the salts of calcium that exist in cow's milk. The chemical result is that often when cow's milk fat is tolerated by the stomach, it causes constipation. It seems to me that this is truest of clean milk such as certified. Probably in those milks that have a high bacterial count the fats are partially broken down in the stomach and the evidences of gastric irritation arise from the presence of excessive amounts of fatty acids or soaps of the higher acids in the stomach, whereas when the milk is clean, the fats reach the saponifying pancreatic lipase unaltered except by the slight emulsifying action of the gastric lipase and of the bile, the alkali salts, and the Co^2 set free by the neutralization.

Dr. Yerington, at the Lane Hospital, in an insufficient series of trials got evidence that seems to indicate that with clean milk of a certain fat, proteid ratio earthy soaps are formed in the intestine and excreted as such but that with a higher proportion of fat there appear free fatty acids, when the fat ratio is still higher free fat is wasted and gives rise to characteristic fat diarrhea. Personally, I think that when looseness of the bowels follows the exhibition of cream, it is most often because market cream or cream from ordinary dairy milk is used. Market cream is a mixture of dirt, starch, or gelatin, fatty acids, and bacteria, and makes a most effective, if rather dangerous, substitute for castor oil or rhubarb. An interesting fact well known to some nurses and mothers is that often when bottle babies are constipated olive oil or cod-liver oil will relieve the condition. It seems probable that this is due to the fact that the soaps of the alkaline earths are soluble in the olein of the oil and so are dissolved in the gut and more readily passed. Both oils carry a relatively high proportion of olein. The greatest objection, however, to the exhibition of excessive amounts of fat comes not from the digestive side but from the nutritive. From the most dependable researches it seems proable that fats after they are rebuilt in the intestinal mucosa are again broken down and reach the cells for utilization as fatty acids and when these acids are in excess they abstract from the body tissues and fluids mineral salts or ammonia radicles for their neutralization. These substances needed for the processes of proteid metabolism, are lost to the economy and there begins a destruction of body albumin. Often the first clinical signs of this damage are the development of a very definite ammoniacal odor in the urine, slight sweating about the head, and a peculiar lack of luster in the hair and skin.

There is little fat digestion in the stomach where, though a small amount of lipase is present, the fat is not in an emulsified condition and where the gastric acidity rapidly puts a stop to its activity. Sedgwick has recently laid much stress on this gastric lipase and has found evidence to support a claim that it acts as an activator of pancreatic lipase. On account of the presence of alkali salts, pancreatic juice, and bile, in the intestine an exceedingly fine fat emulsion is produced. The emulsified fatty acids then react with the alkaline carbonates to form soaps, which soaps tear apart the fine particles of fat, making them still smaller. This process is also accelerated by the carbon dioxid which is set free when the fatty acids unite with the alkalies. The ingested fat is then broken up into fatty acids and glycerol. What proportion of ingested fat is saponified is not known, but the most authoritative investigators believe that it all is. In infants between 5 and 8% of the ingested fat is normally lost by the stool. The soaps are taken up by the gut wall disintegrated and passed on to the tissues probably as fatty acid.

The utilization of fat by the tissues is a physiological mystery incompletely worked out. A certain proportion when there is more than the animal needs for processes of combustion may be deposited as such, but the vastly greater proportion of ingested fat is burnt up and excreted by the lungs as CO_2. The intermediate steps of this process of combustion have never been clearly worked out, but Pohl's experiments suggest that the series of ethane products, malonic, tartronic, mesoxalic, and glyceric acids, which are fully combustible in the body, are the ones normally formed. On the other hand, it is also possible from this work to conceive that an incombustible acid of the series, oxalic, for instance, may be produced by some fault in metabolism, and it is not improbable that this may be the cause of certain cases of acidosis with convulsions and pseudomeningitis.

Abderhalden states that while both fat and carbohydrate can be produced in the body from albumin, it is improbable that such change occurs under ordinary feeding conditions. We must not then regard the albumins as sources of energy, but only as the ground materials for growth and repair. Energy must, for the most part, be derived from fat and carbohydrate. Starches which are polysacchrids and sugars which are inverted in the gut, absorbed through its wall, burned in the muscles, and excreted as carbon dioxid. There is no question but that excess of carbohydrates can be laid down as fat. But whether the reverse is ever true, that is whether fat ever be transformed in the body as carbohydrate is to be doubted.

The ultimate structure of proteids has become more clear to us since Emil Fischer began to work on them. Briefly they are complexes of those chemical compounds called amino or amido acids in which identity is established by the presence of that combination of one nitrogen and two hydrogen atoms known as amine. There are bound up in the combinations, which form proteids, two, three, or more of these amino acids. The combination of two amino acids is known as the diamino; of three triamino and so on until the point is reached where very many are united in one complex molecule, which in Fischer's terminology is known as a polypeptid. These polypeptids appear in early proteid digestion and the final result of such digestion is the breaking down of these into their constituent simple amino acids. These proteid molecules also in some instances, contain sulphur and phosphorus. The casein molecule contains both, and the casein of bovine milk differs from that of human in that a smaller proportion of the phosphorus occurs in organic combination.

From the albumins of the milk, human or bovine, must be formed the varied proteid bodies that occur in the organism of the nursling. As none of these albumins are in the unaltered state, it is obvious that a profound splitting up of the casein, lact albumin and lactoglobulin must occur in the digestive tract of the child. One must marvel at the remarkable ability of the ferments and harmones of the stomach, duodenum, pancreas, and jejunum that rend the complex proteid molecules into their constituent amido acids and the further series of ferments that rebuild these elemental integers of proteid (building stones the Germans name them) into the vast and complex array of cell and humoral albumins specific to the human structure. I will not attempt to burden you with more than to remind you that in considering abnormal digestion we have to keep in mind what Pawlow has taught us that the secretion of gastric juice gives varying response to different stimuli. To physiological stimuli, as hunger, or type of food, if these are insufficient or improper the secretion of gastric juice fails. We have also to remember that the pro-secretin in the duodenum is activated by the gastric juice entering the duodenum and that the proper secretion of pancreatic trypsynogen will depend on the change of the quiescent prosecretin into the active harmone secretin, which without gastric juice of a certain acidity is impossible, and, further, that when the pancreas puts out its secretion in response, that trypsynogen, its ferment is inert until activated by the enterokinase which must be wedded to trypsynogen before the peptid can be broken down into the simpler amido acids and be made fit for absorption. It is easy to understand that a minute error of one sort or another could throw this delicate complex out of order and lead to profound change in the infant's digestion.

Once in the gut wall, ferments as well as the inorganic salts, or at least the ions of inorganic salts, play a part in building up and utilizing these elements of the proteids for the body's needs. Every one of the infant's body cells is busy forming new cells and must obtain its albumin from ingested food. There is no albumin reserve, as there are reserves for fat in the subcutaneous tissues, and for carbohydrate (as glycogen) in the liver. If fat or carbohydrate be fed in excess, provided the digestion endures the overfeeding, these stores are augmented. But if albumin be administered in quantities greater than can be utilized grave metabolic consequences ensue.

Life in some mysterious way is bound up with the presence of colloids in the cells and the life proceses depend on the relation of these colloids to the salts, or those constituents of salts called electrolytes. Colloidal solutions of different sorts exist within the cells and retain their identity. Through them, however, diffuse these crystolloids and electrolytes, dissociating and reassociating without precipitating, for this action is prevented by virtue of the colloidal nature. At one time the action of one ion is dominant, at another time that of another, but on penalty of death the cell must always at a given moment be ready to dominate the action of a given ion. The ingestion of the vast mass of bovine milk salts makes it incumbent on the one hand that the body rid itself of those it does not need, entailing excessive and unusual excretory processes, or on the other hand, that it utilize salts not designed either in quantity or quality for its specific cell functions. Much work has been done, and is now under way in Germany, on the effect of individual salts on the nursling's nutrition. Especially Langsten and Meyer, and Nothman, have dwelt on the power of sodium chlorid solutions to raise temperature and to increase weight, and of calcium to depress temperature and to decrease weight. We are taught that sodium salts exaggerate tetany and spasmophilia, cause rapidity of pulse rate, apathy, frequent stools, and the appearance of sugar in the urine.

Such is a very hurried and cursory glance at the fate of the individual food elements of the infant's dietary. It is neither wise nor necessary in such a review to burden ourselves with the formulae or the terminology of physiological chemistry. But in considering a few facts about the gastric digestion of milk as a complex of fat, albumin, sugar, and salts, we may with profit dwell a moment or two on the subject of colloids and colloidal action.

The recent work of Alexander and Bullowa has thrown light on the vexed question of the differences of the curding of cow's and human milk in the infant stomach. They have emphasized the facts that colloids are of two kinds, one known as reversible, the other as irreversible. The irreversible colloids are readily coagulated by electrolytes and when dried out do not redissolve. However, even a very minute amount of a reversible colloid can protect one of the irreversible colloids from coagulation, so that after desication it will re-dissolve. It is stated that as little as 1/10,000 of 1% of gelatine will protect a colloidal solution. It has been demonstrated that casein is an irreversible coagulating proteid, whereas, the so-called lact albumin is a reversible or protecting colloid. It is well known that one of the striking differences between cow's milk and human milk lies in the fact that in cow's milk there is about 3% of this irreversible colloidal solution of casein and only about ½% of the protecting, while in human milk the casein is 1% and the protecting lact albumin is about 1½%. It is claimed that the effect of this fact on digestion is very clearly shown by the differences in the character of the flocculi of the renin precipitates of the two milks. Woman's milk forms a finely flocculated precipitate hardly visible, whereas cow's milk, being unprotected by reversible colloid, is very thoroughly and firmly coagulated. By the addition of a small amount of any protective colloid whatever, this protective action may be supplied. Many years ago Meigs, and following him Jacobi, advised the use of small amounts of gelatine or gum arabic to prevent the hard curding of milk. Barley water and especially dextrinized gruels and like solutions act as protective colloidal solutions. The success that follows the use of citrate of soda as a milk modifier is suggested by Alexander and Bullowa to be due to the fact that citrate of soda acts as a protective colloid and not as an electrolyte. They have developed the fact also that colloidal protection is not confined to the action on casein but is important in maintaining fat emulsions as well, and that curds which contain much fat tend to cohere and have difficulty in passing the pylorus, and they have some doubt that complete peptonization can take place in the intestine except in the presence of an adequate quantity of protective colloid.

Observations, made in the wards of the Lane Hospital, indicate that the large, tough, leathery, casein curds appear in the stools as a result of the feeding of bacterially contaminated milk. Probably by the development of acidity a change in the electrolytes is produced which interferes with even the moderate amount of protective action that lact albumins ordinarily exert, with the result that the child's digestion suffers. Whether this be the true explanation or not, the following facts convince the writer that the commonest cause of the appearance of casein masses in the stools is the ingestion of unclean milk. The fact that a number of infants being fed on the same milk almost invariably all show the curds at the same time. Under these circumstances a bacterial analysis of such cow's milk will show an inordinately high count. When such milk is replaced by milk known to have a low bacterial count, or by the same milk boiled for 20 minutes without any other change in the formula, the curds will disappear from the stools. In spite of the contention made by many German and many American writers that these hard lima bean-like masses were made up of soaps and intestinal secretions, Talbot has shown that it is possible to sensitize guinea pigs to cow casein and that the sentitized guinea pigs give the same reaction to solutions of such curds as they do to solutions of pure casein.

It has been questioned if the young infant can digest starch. Kerley has shown that a large proportion of infants have power to convert and utilize starches but that the power is relative. Many observers have shown that specific ferments, not ordinarily present, are elaborated when animals are fed unusual food elements and it seems proven that while the amount of pancreatic amylase present is almost negligible in the early weeks of a breast-fed infant's life that it can be increased by moderate starch feeding.

Neither cane sugar nor starch can be utilized by the infant economy, but through the intervention of ferments and by the addition of water must be broken up when laevulose and dextrose are formed and as such are absorbed by the intestine. Milk sugar, too, is a polysaccharid which needs be broken up, in this instance the products of hydrolysis are dextrose, and galactose. For these purposes the salivary amylase of infants is negligible and the bulk of carbohydrate digestion is performed in the small intestine by the pancreatic amylase. Starches are broken down and form maltose which like cane sugar is inverted into dextrose and levulose which are absorbed as rapidly as formed. All the complex carbohydrate must undergo these inversions for normally none of them are absorbed as such into the blood but must be transformed into hexose compound before they can be utilized. As much as a pound of sugar can be absorbed by the intestine in a short time, without increasing the sugar concentration in the blood, which is normally about 12 to 15 grains to the liter. In the liver these molecules of maltose are united to form glycogen. The amount of glycogen that can be stored in the liver is limited, and the amount of sugar stored in the blood and other tissues cannot exceed a certain concentration. Under such circumstances any excess of ingested sugar is transformed into fats for storage. Carbohydrates are of use to the animal organism as sources of heat and muscular energy. In the infant economy the heat supplying function is of course paramount.

The bacterial flora inhabiting the breast-fed nursling's intestine are simple and definite for different levels of the intestine. By their reaction to Gram's Stain the bacteria divide roughly into gram positive and gram negative (the blue and the red bacilli as the Germans call them). In the colon of the breast-fed the majority are slender, gram positive, curved organisms known as the bacillus bifidus which grows readily on highly acid media. There are always a few red stained gram negative coccal forms and a few thick big bacillus aerogenes capsulatus. The bacillus bifidus probably represents an organism that is found deep in the acini of the maternal breast which undoubtedly is the progenitor of the bacteria found in the nursling's gut and enters with the breast milk. The number of bacterial races is greater in the case of the bottle-fed, but the dominant stain is the gram negative colon bacillus ingested with the cow's milk which has been acquired because of fecal contamination. The type of the bacteria is not alone to be considered, but specimens of milk, rich in bacteria, are most likely to contain injurious organisms; such as the germs of typhoid, dysentery, and scarlet fever, streptococci, and staphylococci. The two last are almost constant contaminators of milk and almost as frequently present are the gas formers, sarcinae, and yeasts.

In spite of the differences in the flora, the work of Herter and other competent observers seems to indicate that putrefactive processes in the gut of the healthy bottle-fed baby do not exceed those occurring in the breast-fed infant's intestine and undoubtedly the chief damage done by bacterially-contaminated milk lies in the changes wrought in the milk as a food stuff, and not in infection that follows invasion of the gut by the organisms. The normal flora of the intestine are, for the most part, able to attack and destroy organisms that have passed the sterilizing ordeal of the gastric juice.

It is as foolish to attempt to deal with feeding cases without stool examination as it would be to treat adult kidney cases without urine examinations. The routine examinations of stools are as simply and as rapidly made as routine urine examinations. With the exception of from 2 to 6% of the ingested fat, an infant's stool is normally made up of intestinal secretions and excretions, sugar almost never, and proteid hardly more frequently appear in the evacuation. Starch, when given to very young babies will always be wasted in the stools and this wastage may be taken advantage of to influence the evacuation in cases of constipation provided too much is not given. The stool examination divides itself roughly into naked eye and microscopic observations. If with the naked eye one notes a white or gray hard or crumbly stool it means fat waste, small white lumps mean soaps, green stools sugar or starch fermentation or rarely facterial infection; brown stools result from starch waste or if the stools are very scanty from starvation, yellow brown evacuations looking like crude vaseline follow skimmed milk feeding. The normal stool is yellow, soft and smooth like mustard; a red coloration almost always indicates bacterial infection; small, soft pale lumps of uncolored faeces often erroneously called curds mixed with green stained mucus occur in times of starvation; large, white lima-bean-like masses are due to contaminated milk and are usually mixed casein, fat and soap.

In our microscopic examinations of stools we stain three smears on glass slides. No. 1 with Lugol's solution, No. 2 with Sudan iii, and No. 3 with Escherich's modification of Gram's stain. In the first, if free starch be present it will be determined by the blue iodin starch reaction, in the second free fat and fatty acids, if present, are stained brilliant red by the Sudan, and the third tells whether the bacteria are normal to the infant's intestine or are pathogenic invaders. Fritz Talbot advises that in the study of fat digestion one uses a Fuschin stain as well as Sudan. The latter does not stain neutral fats, but stains fatty acids brilliant red, and soaps dull red, while the Sudan though it does not stain soaps, stains fatty acids indifferently and dyes the neutral fats a bright red.

The reaction of stools to moist litmus paper should always be observed; very acid stools almost always mean excess of sugar in the food, the evacuations of a normal breast-fed child give an acid reaction while those of the healthy bottle-fed baby give an alkaline reaction. When a stool is exceedingly alkaline in reaction it means an excess of proteid in the food with albuminous putrefaction. A study of the odor of stools may give valuable information. A butyric odor usually means fat decomposition; a lactic or an acetic odor, carbohydrate fermentation, while the stools of proteid decomposition have a disagreeable putrefactive smell.

Among the first American physicians to attempt rational modification of milk was Meigs of Philadelphia. His method was based on the idea that mother's milk was the optimum for the infant, and that cow's milk should be made identical with it. This he attempted to do by dilution and the addition of cream and sugar. In the light of what was then known of physiological chemistry this plan seemed to promise a fairly reasonable approximation to woman's milk. In the hands of Meigs and his followers it succeeded so much better than the rule of thumb methods previously in vogue, that it immediately impressed the profession and became the cornerstone of infant feeding. Following this, American physicians attempted to devise a plan by which milk could be more accurately modified. One of the reasons that the method was not more successful was that the foremost apostles of this doctrine, were so impressed with the principle that guided Meigs that they laid too much stress on the need for high fat percentages in infant food mixtures, for the reason that human milk was supposed to be rich in fat. However, much good followed the interest thus aroused in methods of feeding. Another reason for failure was the insistence on too frequent feedings; as many as eight to ten in twenty-four hours were advised. This vicious plan was adopted as a guide even to the number of daily feedings a breast-fed baby should have, to the detriment of the nursing mother and the production of much indigestion in the infant. It can be said in passing that much of the colic and discomfort which affect breast-fed children during the first month and many of the so-called curdy stools which occur at this period are due solely to an excessive number of feedings. A third drawback to the percentage system as then taught was that its devotees dwelt so insistently on the value of very slight modifications in the proportions of fat, proteid and sugar that it was almost impossible for a physician not a trained mathematician, to follow the literature on the subject. Since that time many simple methods for determining percentages have been devised and less stress has been laid on minute variations. One other objection to the plan was that many of the formulae called for market cream which is for the most part a mixture of bacteria, starch, tallow and milk with more or less boric acid or formalin. But by far its greatest defect was the fact that its proponents in devising formulae considered neither nutrition nor metabolism and much of the disturbance created by the food of bottle-fed infants arises from metabolic disturbances which in turn are responsible for a vast amount of seeming indigestion. There is no question but that the principles of percentage feeding should always be kept in mind, as a guide to the concentrations of food best endured by artificially-fed infants, but to be guided merely by a consideration of the percentages in a food mixture without accurately checking up the albumin and energy needs of the child may lead to failure.

Although the followers of the percentage system have always taught that milk curd was most difficult of digestion, proteid in reality is the proximate principle in milk mixtures which seems to give the least trouble. However, one would be loath to accept the teachings of some of the Germans, that an excess of proteid in an infant's diet can always be ignored. Undoubtedly, some infants are severely injured by excessive proteid feeding. In such instances it is usually the casein that is troublesome, and if such children are given whey mixtures, low in casein, they will immediately improve. The clinical picture is one of an uncomfortable child who does not vomit, but has definite gastric distress; in many instances nurses and mothers interpret this distress to be hunger with the result that the child is still further overfed. The stools of such infants are pale yellow or white, rather sticky, with a putrefactive odor quite unlike the stench of the fatty acids contained in the stools of fat indigestion. By this odor also they can be differentiated from the inodorous white soap stools so often the cause of constipation in fat overfeeding.

There is undoubtedly virtue in the principle of maintaining a balance between the fat and proteid proportions in the milk, and mixtures containing twice as much fat as proteid, providing they are given in proper dilutions and are reinforced by proper amounts of proteid in cereal decoctions (especially if the latter be dextrinized) are well tolerated and children thrive on them. 2½% of fat and 1¼% of proteid with 6% of carbohydrate is a good combination, if the 24-hour ration is proper. The top 16 ounces of the average bottle of certified milk will contain approximately twice the fat of the whole milk or between 7 and 8%. The same 16 ounces will run about half so high in proteid. The difficulty with this mixture lies in the fact that as the infant grows its proteid requirements outrun its fat needs, and the child gets too much fat and too little albumin. However, in the earliest months of life such mixtures are not at all inappropriate.

For many years Jacobi of New York was the only eminent pediatrist in this country who strenuously objected to what he called "The Gospel of Top Milk." He has clung persistently to milk dilutions, but he never went so far as some of the Germans in the matter of neglecting casein digestion, and we find that in many of his earlier writings there are discussions of the use of gelatin and he has always insisted on the value of cereal decoctions as milk modifiers; an interesting demonstration of how shrewd clinicians often anticipate scientific demonstration. As has been said, both gelatin and cereal decoctions are now known to be protective colloids which insure the proper coagulation of cow's milk in response to rennin.

While the Americans were working, attempting to approximate cow milk mixtures to mother's milk, Voit and Rubner had worked out the food needs, the albumin needs, and the heat demands of the adult, and had investigated the caloric values of different foodstuffs. Assuming as the unit of energy value the large calorie, that is the amount of heat necessary to raise one liter of water through one degree centigrade, these physiologists showed that there was a specific heat value for each type of food, when burned in the calorimeter. The heat value of one gram of fat was determined to be 9.3 calories. Equal amounts of proteid of carbohydrate gave off but 4.1 calories per gram so these figures were taken by physiologists to express the energy values of the respective foodstuffs.

There now arose a German school of pediatrists, among them being Kamerer, Czerny and Kellar, who attempted to determine the food needs of infants. From their work they laid down the axiom that an infant in the first three months of its life needs from 100 to 110 calories per kilogram per day, that is between 40 and 45 to the pound. In the second three months the demands were found to run between 35 and 40 calories per pound and after the sixth month 32 calories per pound of body weight were found sufficient. It was further shown that a thin baby wastes body heat and has need of a higher caloric content in its food than a fat child of equal weight.

(To be concluded in the November issue.)

A CASE OF CARCINOMA OF THE APPENDIX.

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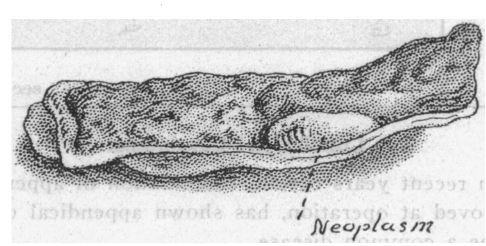
Though many cases of carcinoma of the appendix have been reported, it still seems proper to put additional cases on record.

Miss S., referred to me for operation by Dr. J. W. Shiels, on June 24, 1910, age 22, American, unmarried, states that three years ago she enjoyed good health. Since then she has suffered severe pain before and during her menstrual flow, which though regular, is scant at the beginning but abundant at the end. In March, 1910, an additional pain in the right side appeared during her period, and has since remained in the intervals as well. Frequently sharp pains shoot upward toward the navel from this area of discomfort. She finds she is much more comfortable when her right leg is flexed upon her abdomen. Sitting up is associated with an increase of pain, while the prone position gives relief. She has lost about ten pounds in three months. She has no cough, no fever, no headache, is highly nervous, habitually constipated and has a slight vaginal discharge. Her family history is unimportant. At the beginning of her menstrual difficulties, she suffered from attacks of dyspepsia, which occurred always at the time of menstruation, and were so severe that she was obliged to go to bed.

General examination shows nothing noteworthy. At McBurney's point there is an area acutely sensitive on pressure. There is a definite muscular rigidity over the whole quadrant. Vaginal examination shows uterus and tubes to be very sensitive but is otherwise negative. On July 29th, I removed a somewhat

Fig. 1.



Appendix opened longitudinally, exposing the mucosa and the neoplasm within the lumen.

thickened and adherent appendix about three inches long. Cysts with thin walls were found on both ovaries and resected. The result of the examination of the appendix is as follows:

The specimen consisted of an appendix about 6 cm. in length, which had been opened longitudinally before delivery to laboratory. At about the middle third of the organ a neoplasm was found, firm to the touch, pale pink in color, about the size of a white bean and microscopically did not seem to invade the muscular tunics of the organ. The mucosa was slightly congested above and below the new growth. No enteroliths were present. Fig. 1 shows the organ as opened longitudinally exposing the neoplasm within the lumen.

A section was taken through the tumor at its distal end comprising a portion of the neoplasmic mass as well as the uninvolved mucosa and underlying in-